Missouri Department of Natural Resources

# Total Maximum Daily Load Information Sheet

# Elk River Basin

## Waterbody Segments at a Glance:

**Counties:** Barry, McDonald, Newton
**Nearby Cities:** Noel, Anderson, Neosho
**Lengths of impairment:**
- **Buffalo Creek:** 15.5 miles
- **Elk River:** 21.5 miles
- **Indian Creek:** 26 miles
- **Middle Indian Creek:** 5.5 miles
- **North Indian Creek:** 5 miles
- **South Indian Creek:** 9 miles
- **Patterson Creek:** 2 miles
- **Big Sugar Creek:** 31 miles
- **Little Sugar Creek:** 11 miles

**Pollutant:** Nutrients
**Source:** Point and Nonpoint Sources


State map showing location of watershed

**TMDL Priority Ranking:** TMDL approved 2004

## Description of the Problem

### Beneficial uses of Elk River Basin

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption
- Irrigation
- Cool Water Fishery
- Whole Body Contact Recreation
- Boating and Canoeing

### Use that is impaired

- Protection of Warm Water Aquatic Life

### Standards that apply

Nutrient related water quality standards address proliferation of nuisance algae, turbidity, low dissolved oxygen and organic enrichment.

- The impairment of the Elk River is based on exceedence of the general criteria contained in Missouri's Water Quality Standards, 10 CSR 20-7.031 (3)(A) and (C). These criteria state:
  - Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.

- Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.

**Background information and Water Quality Data**

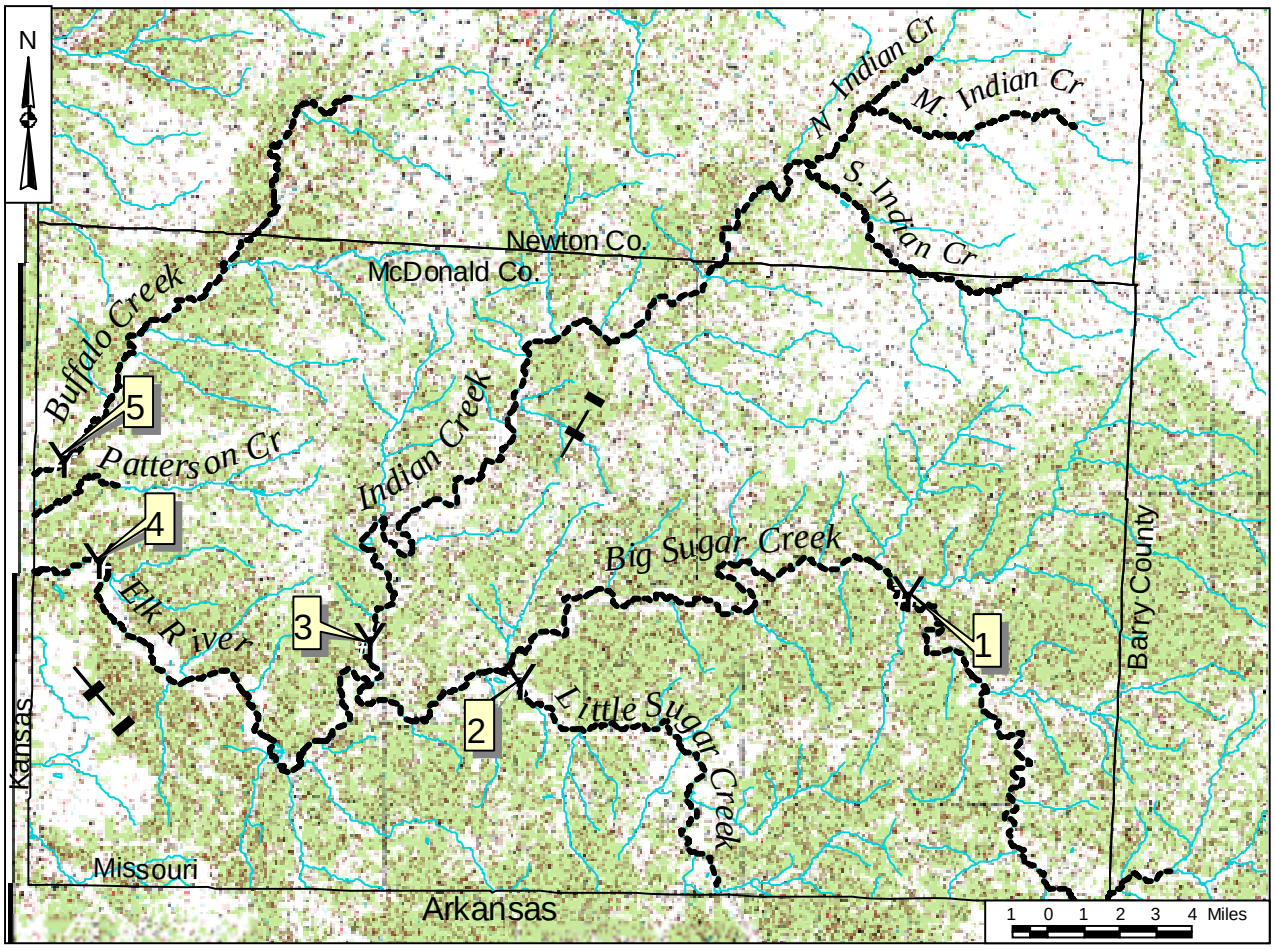
Water quality monitoring of the Elk River near the Oklahoma State line has shown a significant steady increase in the amount of nitrogen in the river over the last 35 years. Several factors are believed to contribute to this trend, but the most significant contributor has been the growth of the poultry production and processing industry in Northwest Arkansas and Southwest Missouri. Much of the poultry litter generated in this region, which is high in nitrogen and phosphorus, is applied to agricultural lands within the Elk River watershed. Because nitrogen and phosphorus are water soluble, they are easily flushed from or through soils into groundwaters and surface streams. Poultry processing plants and growth in population due to the availability of jobs in the poultry industry have also significantly added to the nutrient loading coming from point sources. High nutrient input into a waterbody encourages the growth of nuisance algae. To determine how to stop algal growth, the limiting factor must be identified. The limiting factor is the nutrient that limits the growth of plants, in this case algae, if it is not available in sufficient quantities. Generally, a system is either nitrogen or phosphorus limited. In the Elk River, the ecosystem is phosphorus limited, indicated by an N:P ratio (nitrogen to phosphorus) of 17.

Data suggest that 1985 was the beginning of accelerated phosphorus loading that led to the 1998 303(d) listing of eleven stream segments within the watershed (see Figure 6). The total phosphorus (TP) target for this TMDL is based on historical water quality data collected before 1985. That target is 0.06 mg/L TP. The N:P ratio is then used to calculate the total nitrogen target, which comes out to 1.0 mg/L. Progress toward these targets will be evaluated by analyzing ambient water from the Elk River at the Tiff City gage station.

The watershed has experienced an increase in poultry production that provides the most logical explanation for the surge of nutrient loading that began in 1985. See Figure 6. To address these problems, both point and nonpoint sources will need to make reductions in nutrient loading. For point sources, the TMDL requires all permitted facilities in Missouri discharging to the Elk River or its tributaries and with a design flow greater than or equal to 400,000 gallons per day (0.4 MGD or 0.62 $ft^3/s$), to have total phosphorus limits included in their permit. The limits will be no more than 1.5 mg/L TP as a maximum daily concentration and no more than 1.0 mg/L as a monthly average. To realize reductions in nutrients from nonpoint sources, several 319 grants were approved prior to the writing of the Elk River TMDL. These projects promote a variety of best management practices, Comprehensive Nutrient Management Plans for farms spreading poultry litter, informational meetings, watershed management plans and septic tank management. The culmination of past and present 319 grants will be to produce a comprehensive Watershed Management Plan for the Elk River.

An accomplishment of one 319 project (administered by University of Missouri Extension) was assisting in the establishment of the Elk River Watershed Improvement Association, a citizen's watershed action group. The mission of the organization is "To improve, protect and conserve waters within the Elk River watershed." This is a particularly vital and active group. Beyond implementing plans to reduce nutrients in the Elk River, local citizens have also expressed concern regarding bacteria levels, sedimentation, gravel mining and littering. The U.S. Environmental Protection Agency approved the Elk River TMDL March 26, 2004.

## Map of Sampling Sites on the Impaired Portions of Elk River and its Tributaries

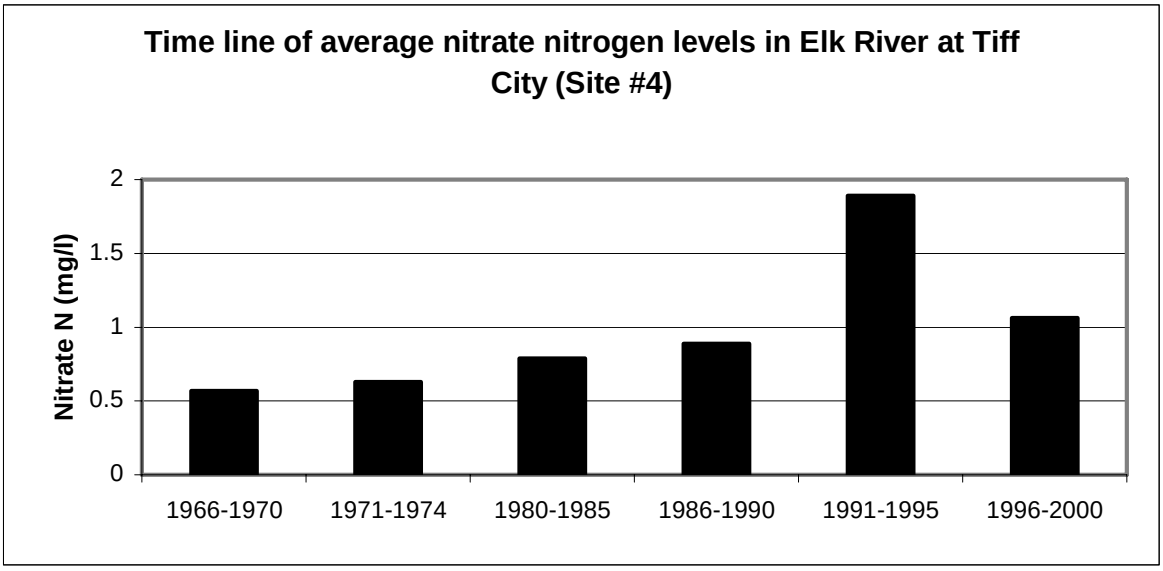



Impaired segments  Direction of flow

**Site Index**

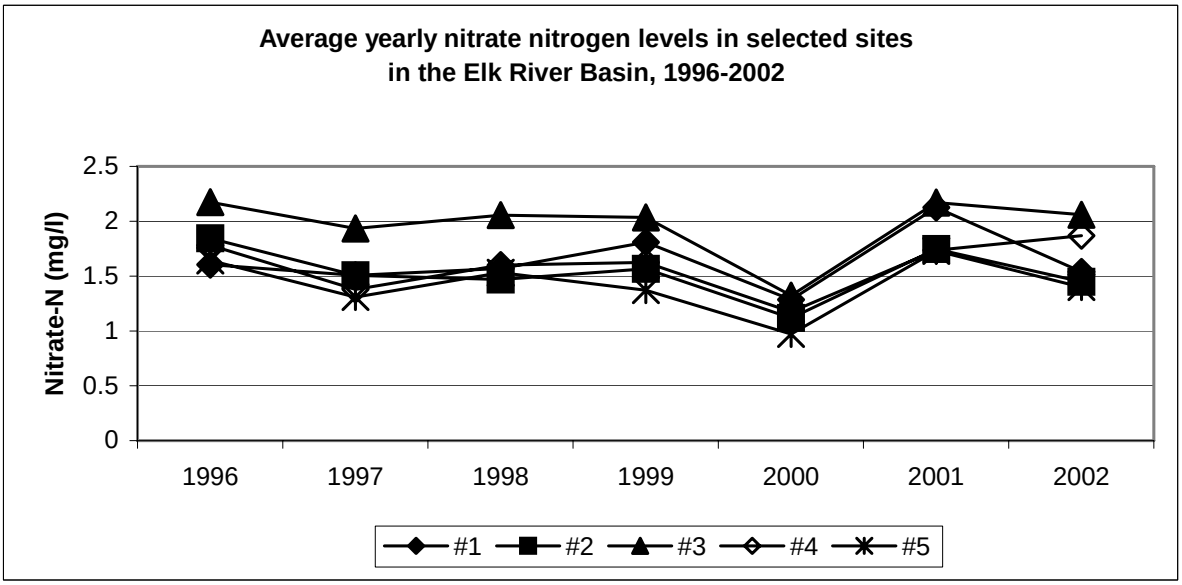
1 – Big Sugar Creek at County Highway E
2 – Little Sugar Creek at County Highway K
3 – Indian Creek at Lanagan
4 – Elk River at Tiff City
5 – Buffalo Creek at Tiff City

**Figure 1**
**Time line of average nitrate nitrogen levels in Elk River at Tiff City (Site #4)**



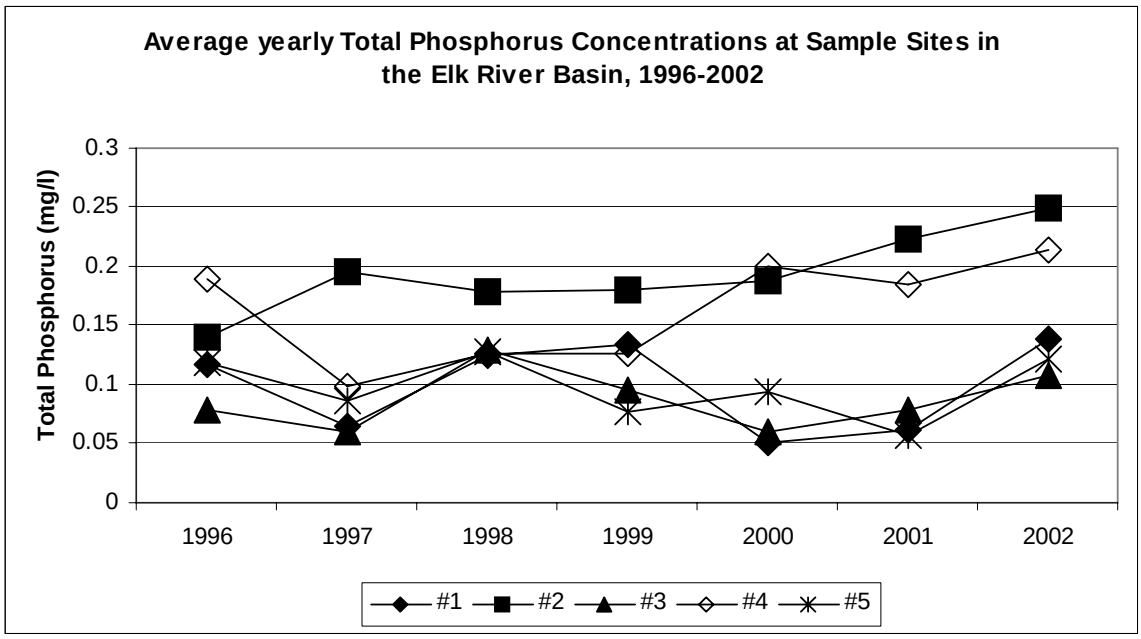

Sources: Missouri Department of Natural Resources, U.S. Geological Survey, Crowder College

**Figure 2**
**Average Yearly Nitrate Nitrogen Levels 1996-2002**



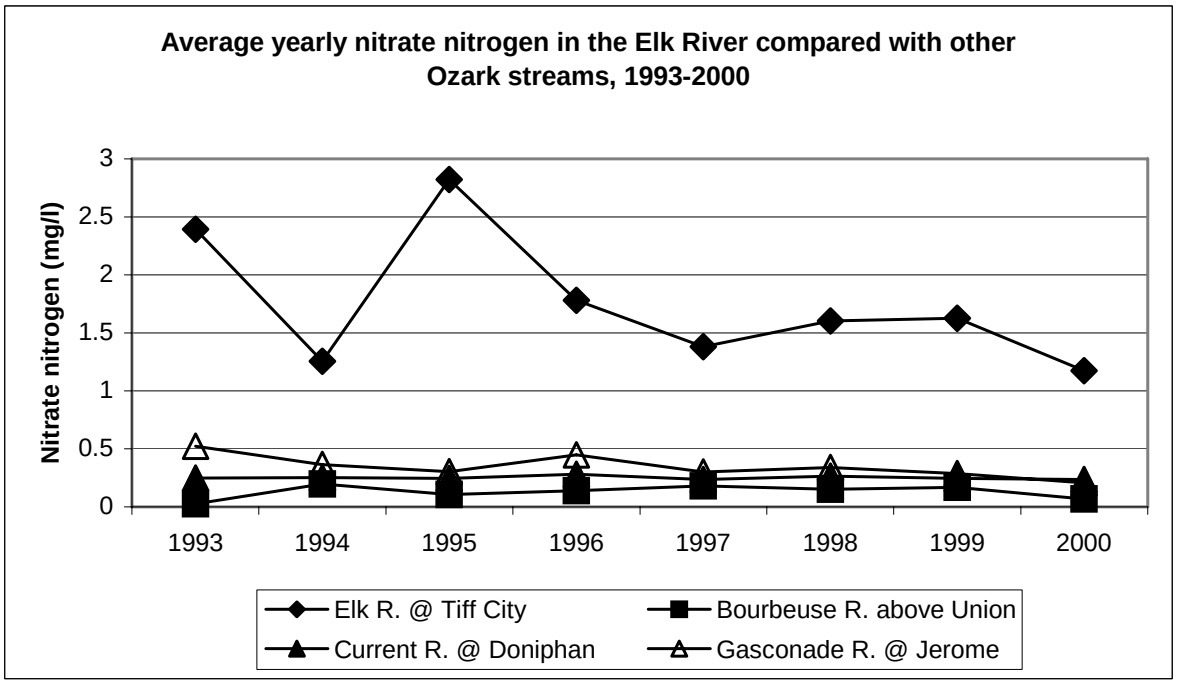

Sources: Missouri Department of Natural Resources, U.S. Geological Survey, Crowder College

**Figure 3**
**Average Yearly Total Phosphorus Concentrations 1996-2002**



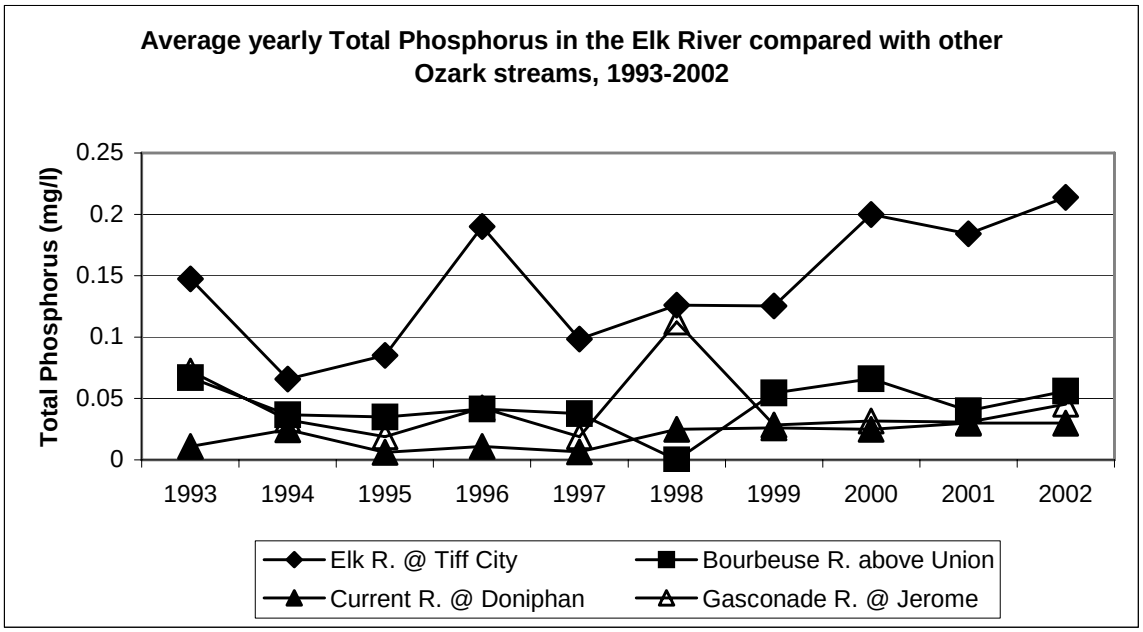

Sources: Missouri Department of Natural Resources, U.S. Geological Survey, Crowder College

**Figure 4**
**Average Yearly Nitrate Nitrogen 1993-2000**




Source: U.S. Geological Survey

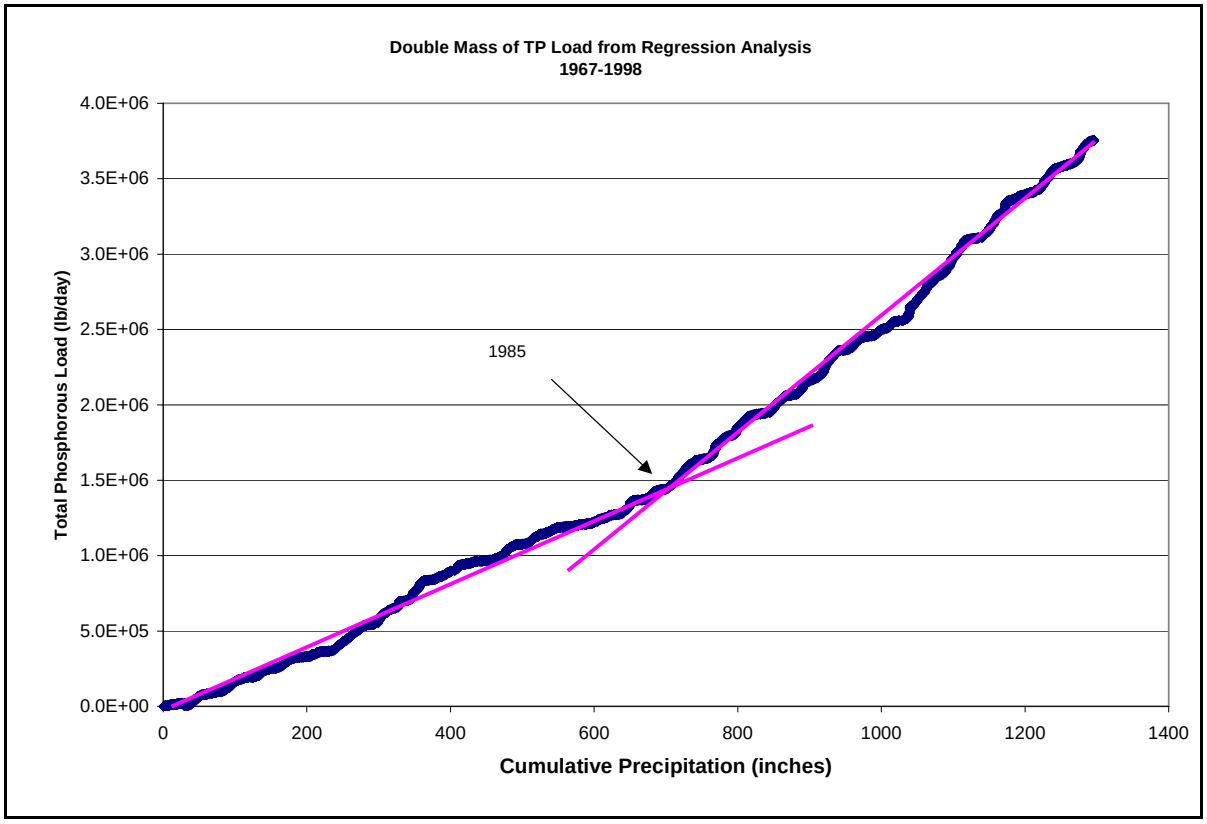
**Figure 5**
**Average Yearly Total Phosphorus 1993-2002**




Source: U.S. Geological Survey

Figure 6 below shows the increase in phosphorus loading that started in 1985.

**Figure 6**
**Linear Regression of Corrected Cumulative Total Phosphorus and Precipitation**

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